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Sensor Needs for Advanced Life Support
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Abstract

Sensors and feedback systems are critical to life support flight systems and life support systems research. New sensor capabilities can allow for new system architectures to be considered, and can facilitate dramatic improvements in system performance. This paper will describe three opportunities for biosensor researchers to develop sensors that will enable life support system improvements.

The first opportunity relates to measuring physical, chemical, and biological parameters in the Space Station Water Processing System. Measuring pH, iodine, total organic carbon, microbiological activity, total dissolved solids, or conductivity with a safe, effective, stable, reliable microsensor could benefit the water processing system considerably. Of special interest is a sensor which can monitor biological contamination rapidly.

The second opportunity relates to sensing microbiological contamination and water condensation on the surface of large inflatable structures. It is the goal of large inflatable structures used for habitation to take advantage of the large surface area of the structure and reject waste heat passively through the walls of the structure. Too much heat rejection leads to a cold spot with water condensation, and eventually microbiological contamination. A distributed sensor system that can measure temperature, humidity, and microbiological contamination across a large surface would benefit designers of large inflatable habitable structures.

The third opportunity relates to sensing microbial bioreactors used for waste water processing and reuse. Microbiological bioreactors offer considerable advantages in weight and power compared to adsorption bed based systems when used for long periods of time. Managing and controlling bioreactors is greatly helped if distributed microsensors measured the biological populations continuously in many locations within the bioreactor. Nitrifying bacteria are of special interest to bioreactor designers, and any sensors that could measure the populations of these types of bacteria would help the control and operation of bioreactors.